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MISA
Municipal/Industrial Strategy for Abatement

ACUTE LETHALITY DATA FOR ONTARIO'S METAL MINING SECTOR EFFLUENTS COVERING THE PERIOD FROM FEBRUARY 1990 TO JANUARY 1991

Ontario
Environment
Environnement

09/07/1992

ISBN 0-7729-9766-7

ACUTE LETHALITY DATA FOR ONTARIO'S METAL MINING SECTOR EFFLUENTS COVERING THE PERIOD FROM FEBRUARY 1990 TO JANUARY 1991

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JULY 1992

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Log 92-2345-101
PIBS 2056E

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SUMMARY

Under the MISA program, the Metal Mining Sector was required to conduct laboratory toxicity tests to monitor its wastewater discharges for acute lethality to rainbow trout and to *Daphnia magna*. This requirement was based on the Ontario Environmental Protection Act, which allows the Ministry to write regulations requesting persons responsible for sources of contaminants to monitor, record and report to the Ministry. The requirements for toxicity testing are in the General Effluent Monitoring Regulation (Ontario Regulation 695/88) and in the Effluent Monitoring Regulation For The Ontario Mineral Industry Sector: Group A (Ontario Regulation 491/89). Some additional information is in, "The Development Document For The Effluent Monitoring Regulation For The Ontario Mineral Industry Sector: Group A" (Env. Ont. 1989). The monitoring data will be used, in part, to develop effluent limits for acute toxicity. This report is a compilation of the toxicity data for samples collected for the MISA monitoring year from February 1990 to January 1991, and for audit samples tested at the Ministry's laboratory in Rexdale. It also includes data from a few inspection samples taken between February, 1991 and October, 1991.

The regulatory toxicity tests were conducted by standard procedures (Protocol To Determine The Acute Lethality Of Liquid Effluents To Fish, Env. Ont. July 1983 and *Daphnia magna* Acute Lethality Toxicity Test Protocol, Env. Ont. April 1988). In these tests, the organisms are exposed to undiluted effluent and several effluent dilutions for a fixed period. The trout toxicity test is a 96 hour exposure, and a *Daphnia* toxicity test is a 48 hour exposure. The number of organisms that died is the toxic effect that is recorded. The quantitative measure of toxicity is the median lethal concentration (LC50) which is the concentration of effluent estimated to cause mortality to 50% of the test organisms.

The frequency of sampling was quarterly for all sites, however, exploration sites and sites with intermittent discharges were exempted from all or part of their sampling requirements.

The following sites were missing samples for part of the year because they had intermittent discharges: Kidd Creek Mine, Kidd Township, 4th quarter; Whistle, Sudbury, 1st and 3rd quarters; Bell Creek, Timmins, 1st, 2nd, and 3rd quarters; Dome Mine, Timmins, 4th quarter; ERG Resources, Timmins, 1st, 2nd, and 3rd quarters; Renabie Gold Mines Ltd., Renabie, 1st quarter; St. Andrews Gold Fields, Stock Township, 1st, 2nd, and 3rd quarters; Algoma Ore Division, Wawa, 3rd and 4th quarters; Dona Lake Mine, Pickle Lake, 4th quarter; Golden Giant Mine, Hemlo, 1st, 2nd, and 3rd quarter; Arthur W. White, Golden Township, 1st quarter; Pronto, Spragge, 3rd quarter.

The following sites were listed in the monitoring regulation but: A) were not required to

perform toxicity testing because of their exploration development status in the monitoring regulation; or B) did not have enough discharge volume to sample at any time of the year; or C) suspended mining activities before the regulation came into effect; or D) did not submit toxicity results due to unexpected economic or legal circumstances: Aquarius Mine, Timmins; Ateba Mines Ltd., Beardmore; Aunor-Delnite, Timmins; Broulan Reef, Timmins; Chesbar Resources Inc., Chester Township; Citadel Gold Mines Inc., McMurray Township; Jerome Mine, Osway Township; Magnet Mine, Errington Township; Majino Mine, Finan Township; Mishibishu Lake, Wawa; Opamisken Lake, Pickle Lake; Owl Creek Mine, Timmins; Ross Mine, Timmins; Scadding Mine, Scadding Township; Leroy Project, Gowanda; Penna Mine, Coleman Township; Magnacon Mine, Wawa, Paymaster Gold Mines Ltd., South Porcupine.

Toxicity test results from 10 samples were submitted by discharges but were not put into the database because either the test protocol was not followed (4 tests including samples with minor violations of the test protocol from Metallurgical Site, Falconbridge Ltd., Hoyle Township; Renabie Gold Mines, Renabie; Refinery, Cameco, Blind River; David Bell Mine, Hemlo) or there were electronic problems with the submission (6 tests including samples from Kidd Creek Mine, Kidd Township; Metallurgical Site, Falconbridge Ltd., Hoyle Township; Refinery, Cameco, Blind River where the trout and Daphnia data were submitted on the same disk and they could not be loaded).

The monitoring occurred at 51 sampling locations at 46 sites. For 11 sites, samples were consistently lethal to one or both of the test animals. For 6 sites, samples were frequently, but not always lethal to one or both animals. For 14 sites, samples were sometimes lethal to one or both of the test animals. From the remaining 15 sites, samples were normally non-lethal to both animals. For the period of February, 1990 to October, 1991, the Ministry reviewed the results for 217 trout and 212 *Daphnia* tests. For trout: 118 samples were nonlethal, 38 samples had LC50s > 100% effluent and 61 samples were lethal (LC50 < 100% effluent). For *Daphnia*: 91 samples were nonlethal, 57 samples had LC50s > 100% effluent and 64 samples were lethal (LC50 < 100% effluent).

The Ministry of the Environment's Aquatic Toxicity Unit performed 103 audit tests over the monitoring period, and found that the results of audits were generally consistent with the results submitted by industry. The differences that were observed between the results can be explained primarily by variability in effluent quality; the audits were not tests of split samples.

A preliminary interpretation of the toxicity results, concerning the possible causes of acute lethality, is given below. The Toxicity Test Reports for the samples, reports summarizing the analytical chemistry data for each process effluent, as well as plots from the electronic database were used for this purpose.

BASE METAL MINES CONCENTRATORS AND REFINERIES.

The final discharge of the Copper Cliff Treatment Plant, Inco, Sudbury; the final discharge at Geco Division, Noranda Minerals, Manitouwadge; the minewater discharge of the Kidd Creek Mine, Falconbridge Ltd., Kidd Township; the minewater at the Levack site, Inco Ltd., Sudbury; the discharge from the mine pond at the Onaping mine, Falconbridge Ltd., Sudbury; and the final discharge of the refinery, Inco Ltd., Port Colborne were all frequently lethal to trout. In all but the Onaping mine, copper levels alone were high enough (above 0.1 mg/L) to explain at least part of the observed toxicity to trout (Provincial Water Quality Objective Development Document for Copper, MOE, unpublished). In all but Geco, pH levels were high enough (above 10) to cause acute lethal effects on trout. Ammonia (at Geco and Onaping), zinc (at Kidd Creek) and nickel (at Levack) are other effluent constituents of these effluents that may have contributed to the toxicity to trout.

The final discharge at Geco Division, Noranda Minerals, Manitouwadge; the minewater discharge of the Kidd Creek Mine, Falconbridge Ltd., Kidd Township; the discharge from the mine pond at the Onaping mine, Falconbridge Ltd., Sudbury; the minewater at the Whistle mine, Inco Ltd., Sudbury; and the final discharge of the refinery, Inco Ltd., Port Colborne were all frequently lethal to *Daphnia*. Except for the Whistle mine, which was probably lethal to *Daphnia* due to high pH, all the other discharges had high enough levels of copper (>0.1mg/L) to explain at least part of the observed toxicity to *Daphnia*. In all but Geco, pH levels were high enough (above 10) to cause acute lethal effects on *Daphnia*. Ammonia (at Geco and Onaping) and zinc (at Kidd Creek) are other constituents of these effluents that may have contributed to the toxicity to *Daphnia*.

There were some samples toxic to either test animal from several of the other base metal mines and refineries. The small number of samples coupled with the variability of effluent quality from one sampling time to the next does not provide data sufficient to identify the toxic chemicals. Samples from the Nickel Refinery, Inco, Sudbury and from the Nickel Refinery, Falconbridge, Sudbury caused an unusual form of toxicity to *Daphnia*, called in the rest of this document "bell" shaped toxicity. Typically, at full strength effluent none of the animals die but when diluted slightly, some animals die, then when diluted further more animals survive. The substances causing this are unknown but it should be noted that a single concentration (full strength effluent) test would miss this toxicity

GOLD MINES, CONCENTRATORS AND SMELTERS

The final discharge to Balmer Creek at the Arthur W. White Mine, Dickenson Mines, Golden Township (the same discharge as Campbell Red Lake Mine, Placer Dome) was frequently lethal to *Daphnia*, and on one occasion lethal to trout. This could be explained by copper levels in excess of 0.3 mg/L. Also, arsenic levels in excess of 0.6 mg/L could account for the *Daphnia* lethality. The final discharge at Renabie Gold Mines Ltd., Renabie was frequently lethal to both trout and *Daphnia*. The probable cause was copper in excess of 0.1 mg/L. Zinc and cyanide could also have contributed to the toxicity. The final discharge of the Detour Lake Mine, Placer Dome Inc., Detour Lake was consistently lethal to *Daphnia* and trout. The samples were normally more toxic to *Daphnia* than to trout. The copper levels were normally above 0.1 mg/L and frequently above 0.3 mg/L. Cyanide may also have contributed to the toxicity. The final discharge of the Dome Mine, Placer Dome Inc., Timmins was consistently lethal to *Daphnia* but not to trout. The reason is unclear, but copper in excess of 0.1 mg/L was measured.

There were some samples toxic to either test animal from several of the other gold mines. The small number of samples coupled with the temporal variability in the effluents does not provide enough data to judge the causes of toxicity. One sample from each of the final discharges from the Muskegsagagen Lake mine, Bond Gold Canada, District of Kenora and the final discharge from the Dona Lake Mine, Placer Dome Inc., Pickle Lake had "bell" shaped toxicity curves.

IRON MINES

All samples from Algoma Ore Division, Algoma Steel Corporation, Wawa were non-lethal to both animals.

URANIUM MINES AND REFINERIES

Except for one sample in January 1991 from the Denison Property, Denison Mines Ltd., Elliot Lake, that was lethal to both animals, the final discharge was normally non-lethal. Quirke is sometimes lethal to either animal. One of the Daphnia tests had a "bell" shaped toxicity curve. The refinery, (Cameco) in Blind River was normally lethal to both animals. The cause for this was unclear but the refinery discharge does have high levels of oil and grease. The other refinery in Port Hope was consistently non-lethal to both animals. The Stanleigh site, Rio Algom Ltd., was normally non-lethal to both animals, although one sample had a "bell" shaped toxicity curve to *Daphnia* (see previous discussion). The Stanrock property, Denison Mines was normally non-lethal to trout and *Daphnia* but had one toxic sample to trout and two to *Daphnia*. The cause for this is unknown.

CONCLUSIONS

For some samples, *Daphnia* were more sensitive than trout but there were many samples for which the reverse was true. Of the toxic samples from the sector as a whole, about 50 % of the samples were more toxic to trout and the other 50% were more toxic to *Daphnia*. Samples from some sites were more toxic to one animal than to the other but for many other sites, the relative sensitivity of the two animals reverses from one sample to the next, probably due to variations in effluent quality over time. The toxicity database for the Metal

Mining Sector shows that tests of both species are needed to better assess and control the potential impact of these complex and variable effluents on the aquatic environment.

Reduction in pH to below 10 and reduction in copper levels to below 0.1 mg/L would do the most to eliminate acute lethality. Since small adjustments of pH can greatly alter the toxicity of many substances even near neutral pH levels, reduction of toxicity by pH adjustment may only be valuable for effluents outside acceptable pH ranges. Effluents that already have acceptable pH levels may actually increase in toxicity if they are adjusted. The impact of pH cannot be separated from that of the other toxicants because it can have a direct toxic action and a modifying effect on the physical, chemical and toxic properties of other effluent constituents.

The relationship of pH to metal toxicity is complex. There is evidence in the toxicity literature that when measured as total metal, the toxicity of heavy metals tends to increase with decreasing pH in the range of 9 to 7. Recent studies have shown that this can be explained by the overriding change in physical form of the metals towards hydroxides and carbonates that occurs as pH rises from 7 to 9 (Bradley and Sprague, 1987. Can. J. Fish. and Aquatic Sci., 42: 730). In fact, the toxicity of the most toxic forms (dissolved metal ions and hydroxides) actually **decreases** with decreasing pH from 9 to 7. For copper, LC50s regardless of speciation tend to be below 0.1 mg/L at high pH. Unfortunately, none of the literature on metal toxicity deals with pH above 9 so that the impact of pH adjustment should be investigated on a site by site basis. It is clear, however, that pH itself is acutely lethal above 10 and causes sublethal effects above 9. It is also clear that copper above 0.1 mg/L can be lethal depending on conditions and is almost always lethal above 0.3 mg/L (Howarth and Sprague, 1977. Water Research, 12: 455). There were only 3 individual samples for the whole sector where the sample was non-lethal to trout yet the copper concentration measured on the same day was over 0.3 mg/L.

Ammonia is a common toxicant at a number of the sites in the metal mining sector. A review of acute lethality in relation to total ammonia is difficult since even ammonia values that the toxicological literature predicts would be acutely lethal do not always result in acute lethality in these tests. It is possible that ammonia is being lost during shipping for the toxicity tests or that some mitigating factor is present in the effluent mixtures. There are a few sites where ammonia values are so high that they are probably at least contributing to the acute lethality observed. These sites have been mentioned above.

The toxicity tests will detect harmful concentrations and mixtures of most chemical constituents of effluents. But compliance with end-of-pipe limits for acute toxicity would not necessarily control the potential effects of environmental contamination that can be caused by the loading of bioaccumulative substances. These substances are generally nonpolar organic chemicals of high molecular weight and low water solubility or metals such as mercury which accumulate in their organic forms or cadmium which can cause permanent damage at sublethal levels accumulating over the life span of aquatic animals. Neither mercury or cadmium were identified as major problems for this sector in Ontario.

The body of this report presents the summaries of the acute lethality data, grouped by company. These summary pages are part of the complete database, that includes the Toxicity Test Report submitted by industry for each test sample. The details from the database are available from the Water Resources Branch, upon request. The comment fields on individual Toxicity Test Reports were entered by the industry's laboratory performing the tests, and should not be expected to be consistent across samples and do not necessarily represent the views of the Ministry.

COMPANY: Algoma Ore Div.-Algoma Steel Corp., Wawa (40105)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two trout bioassays submitted indicated that samples of the Final Decant effluent were not acutely lethal to test fish. An audit sample conducted by MOE was also non-lethal.

Final Decant

03900253 sampled: 03/29/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

01900081 sampled: 05/02/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

03900433 sampled: 05/31/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non lethal

COMPANY: Algoma Ore Div.-Algoma Steel Corp., Wawa (40105)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of two Daphnia bioassays submitted indicated that samples of the Final Decant were not acutely lethal to test animals. The second sample submitted had an LC50 of >100% effluent. An audit sample conducted by MOE also had an LC50 of >100%.

Final Decant

```
03900253  sampled: 03/29/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

02900081  sampled: 05/02/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

03900433  sampled: 05/31/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non lethal
```

COMPANY: Arthur W.White Mine-Dickenson Mines, Golden Township (34480004)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

Note that samples from the Arthur W. White Mine are from the same location as those from Campbell Red Lake and Dickenson Mines. The data for the two trout bioassays submitted to MOE determined that samples of the Final Discharge/Balmer Creek effluent were non-lethal. The data for a third trout bioassay submitted to MOE indicated that the sample was acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the fish by the end of the four days exposure was 88.4 % effluent. An audit sample tested by MOE had an LC50 of >100% effluent.

Final Discharge/Balmer Ck

```
01900128  sampled: 06/25/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

04904677  sampled: 10/24/90     LC50:      88.4 %
  95% fid. limits:    0.0 -   0.0 %
  comments:

04910338  sampled: 01/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

03910416  sampled: 07/16/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MOE Audit. Effluent Hardness= 160 mg/L.
```

COMPANY: Arthur W.White Mine-Dickenson Mines, Golden Township (34480004)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

Note that samples from the Arthur W. White Mine are from the same location as those from Campbell Red Lake and Dickenson Mines. The final discharge to Balmer Creek were commonly acutely lethal to Daphnia. The cause of this toxicity is unknown. One of two Daphnia bioassays submitted to MOE was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the animals by the end of the two days exposure was 44.3 % effluent. The second sample submitted had an LC50 >100%. Two audit samples were tested by MOE and had an LC50s of 44.6 and 34.1 % effluent.

Final Discharge/Balmer Ck

```
02900128  sampled: 06/25/90     LC50:      44.6 %
  95% fid. limits:   40.5 -  49.1 %
  comments: MISA Audit; Increase in D.O.

04904677  sampled: 10/24/90     LC50:      44.3 %
  95% fid. limits:   35.2 -  55.7 %
  comments:

04910338  sampled: 01/22/91     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments:

03910416  sampled: 07/16/91     LC50:      34.1 %
  95% fid. limits:   24.9 -  49.5 % slope:     3.5
  comments: Effluent Hardness = 160 mg/L; MOE Audit
```

COMPANY: Bell Creek - Canamax Resources Inc., Timmins (46950002)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one trout bioassay submitted to MOE under the MISA monitoring regulation in 1990, indicated the Final Discharge effluent to had been not acutely lethal to test fish. An audit sample tested by MOE was also non-lethal.

Final Discharge

01900180 sampled: 08/21/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Non-lethal

06901460 sampled: 09/18/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: NO MORTALITY OR SUBLETHAL IMPAIRMENT OBSERVED

COMPANY: Bell Creek - Canamax Resources Inc., Timmins (46950002)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one Daphnia bioassay submitted to MOE under the MISA monitoring regulation in 1990, indicated the Final Discharge effluent was not acutely lethal to test animals. An audit sample tested by MOE was also non-lethal.

Final Discharge

```
02900180  sampled: 08/21/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

06901461  sampled: 09/18/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: THERE WERE ZOOPLANKTON IN SAMPLE-IT WAS FILTE
```

COMPANY: Copper Cliff Treatment Plant - Inco, Sudbury (1690304)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The Final Discharge was consistently lethal to trout. The copper is usually above 0.1 mg/L. The pH of the effluent is normally close to 10. Nickel and selenium may also contribute to the toxicity. The data for five trout bioassays submitted to MOE indicated that samples from the Final Discharge effluent were acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure were 72.7, 80.6 and 80.6, 80.6, and 88.0%. Three audit samples were also tested. One of these was non-lethal and the other two were acutely lethal. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 67.1 and 80.6 %.

Final Discharge

```
03900438  sampled: 06/04/90     LC50:       72.7 %
  95% fid. limits:   60.6 -  87.1 % slope:     8.1
  comments:

01900101  sampled: 06/04/90     LC50:       67.1 %
  95% fid. limits:   58.2 -  77.4 %
  comments: MISA Audit

01900185  sampled: 08/28/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal

03900792  sampled: 09/10/90     LC50:       80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:

03900979  sampled: 11/12/90     LC50:       80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:

01910011  sampled: 01/15/91     LC50:       80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments: MISA Audit

03910041  sampled: 01/21/91     LC50:       80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:
```

COMPANY: Copper Cliff Treatment Plant - Inco, Sudbury (1690304)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE indicated that samples from the Final Discharge effluent were acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 56.7 %. Two of the other three submitted samples were non-lethal. The third had an LC50 of >100%. Three audit samples were also tested. Two of these were non-lethal and the other one was acutely lethal. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was between 60.0 and 100 % effluent.

Final Discharge

```
03900438  sampled: 06/04/90     LC50:       56.7 %
  95% fid. limits:   30.9 - 103.8 % slope:      1.5
  comments: Lethal

02900101  sampled: 06/04/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Very High Conductivity

02900185  sampled: 08/28/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

03900792  sampled: 09/10/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

03900979  sampled: 11/12/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

02910011  sampled: 01/15/91     LC50:       60.0 - 100.0  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; High Conductivity

03910041  sampled: 01/21/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal
```

COMPANY: Crean Hill - Inco Ltd., Sudbury (1690809)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples of the minewater are occasionally lethal to trout. This occurred when the pH was well above 10. The data for two of four trout bioassays submitted to MOE indicated the Minewater effluent was not acutely lethal to test fish. One sample had an LC50 of 75.0 % effluent and the remaining sample when tested produced a 96 hour LC50 of > 100 % effluent. Two audit samples were also tested by MOE. One of these was non-lethal and the other produced a 96 hour LC50 of 51.0 % effluent.

Minewater

```
01900022  sampled: 02/26/90     LC50:       51.0 %
  95% fid. limits:   40.0 -  65.0 %
  comments: MISA Audit

03900456  sampled: 06/06/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

03900797  sampled: 09/11/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

03900983  sampled: 11/13/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

01900265  sampled: 11/19/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

03910051  sampled: 01/22/91     LC50:       75.0 %
  95% fid. limits:   61.4 -  91.4 % slope:     8.1
  comments:
```

COMPANY: Crean Hill - Inco Ltd., Sudbury
(1690809)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for four Daphnia bioassays submitted to MOE indicated the Minewater effluent had LC50s >100% effluent. Two audit samples were also tested by MOE. One of these was non-lethal and the other produced a 48 hour LC50 of between 60 and 100% effluent.

Minewater

```
02900022  sampled: 02/26/90     LC50:      60.0 - 100.0  %
  95% fid. limits:   60.0 - 100.0 %
  comments: MISA Audit

03900456  sampled: 06/06/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 > 100

03900797  sampled: 09/11/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

03900983  sampled: 11/13/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

02900265  sampled: 11/19/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal; high conductivity

03910051  sampled: 01/22/91     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100
```

COMPANY: David Bell Mine - Teck Corona Corp., Hemlo (31750003)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for four trout bioassays submitted to MOE under the MISA monitoring regulation in 1990, indicated the Final Discharge effluent was not acutely lethal to test fish. Two audit samples tested by MOE were also non-lethal.

Final Discharge

04901101 sampled: 05/23/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

04902204 sampled: 07/10/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: non-lethal

04903625 sampled: 09/12/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

01900269 sampled: 11/27/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

04905582 sampled: 12/12/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: non-lethal

03910515 sampled: 09/09/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Effluent Hardness = 1390 mg/L; MOE Audit

COMPANY: David Bell Mine - Teck Corona Corp., Hemlo
(31750003)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY
The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation in 1990, indicated the Final Discharge effluent was not acutely lethal to test animals. The other three samples had LC50s >100% effluent. An audit sample tested by MOE had an LC50 between 60 and 100% effluent.

Final Discharge

```
04901101  sampled: 05/23/90     LC50:  >100  %
  95% fid. limits:    0.0 -    0.0 %
  comments:

04902204  sampled: 07/10/90     LC50:  >100  %
  95% fid. limits:    0.0 -    0.0 %
  comments:

04903625  sampled: 09/12/90     non-lethal
  95% fid. limits:    0.0 -    0.0 %
  comments:

02900269  sampled: 11/27/90     LC50:      60.0 - 100.0  %
  95% fid. limits:    0.0 -    0.0 %
  comments: MISA Audit; High conductivity

04905582  sampled: 12/12/90     LC50:  >100  %
  95% fid. limits:    0.0 -    0.0 %
  comments:
```

COMPANY: Denison Property-Denison Mines Ltd., Elliot Lake (1680008)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for four trout bioassays submitted to MOE under the MISA monitoring regulation in 1990, indicated both Final Discharge effluents were either not acutely lethal to test fish or had LC50s of >100% effluent. One sample of the Final Discharge produced a 96 hour LC50 of 80.6 % effluent. An audit sample of the Final Discharge tested by MOE was determined as non-lethal to test fish.

Final Discharge

```
03900259  sampled: 04/02/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Non-lethal

01900084  sampled: 05/08/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: MISA Audit; Non-lethal

03900561  sampled: 07/03/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 > 100

03900871  sampled: 10/01/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 >100

03910003  sampled: 01/07/91     LC50:      80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:
```

Final Discharge

```
03900258  sampled: 04/02/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Non-lethal

03900560  sampled: 07/03/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 > 100

03900872  sampled: 10/01/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 > 100
```

```
 03910004  sampled: 01/07/91     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal
```

Rain Gauge

COMPANY: Denison Property-Denison Mines Ltd., Elliot Lake (1680008)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for four sets of Daphnia bioassays submitted to MOE under the MISA monitoring regulation in 1990, indicated both Final Discharge effluents were either not acutely lethal to test animals or had LC50s >100% effluent. One sample of the Final Discharge produced a 48 hour LC50 of 70.7 % effluent. An audit sample tested by MOE was determined as non-lethal to test animals.

Final Discharge

03900259 sampled: 04/02/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

02900084 sampled: 05/08/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Very High Conductivity

03900561 sampled: 07/03/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non lethal

03900871 sampled: 10/01/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

03910003 sampled: 01/07/91 LC50: 70.7 %
95% fid. limits: 50.0 - 100.0 %
comments:

Final Discharge

03900258 sampled: 04/02/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 >100

03900560 sampled: 07/03/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 >100

03900872 sampled: 10/01/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

```
 03910004  sampled: 01/07/91     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100
```

Rain Gauge

COMPANY: Detour Lake Mine - Placer Dome Inc., Detour Lake (28940005)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The Final Discharge is consistently lethal to trout. The copper levels are normally above 0.1 mg/L and frequently above 0.3mg/L. Cyanide may also contribute to the toxicity. The data for three of four trout bioassays submitted to MOE under the MISA monitoring regulation in 1990, indicated the Final Discharge effluent to have been acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure were 24.1, 75.6 and 59.2 % effluent. The remaining sample was non-lethal. An audit sample tested by MOE was also determined as acutely lethal. The 96 hour LC50 for the audit sample was 80.6 % effluent.

Final Discharge

03900142 sampled: 02/18/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

03900382 sampled: 05/13/90 LC50: 24.1 %
95% fid. limits: 18.3 - 31.5 % slope: 5.5
comments:

01900156 sampled: 07/24/90 LC50: 80.6 %
95% fid. limits: 65.0 - 100.0 %
comments: MISA Audit

03900672 sampled: 08/12/90 LC50: 75.6 %
95% fid. limits: 55.0 - 103.7 % slope: 3.4
comments:

03901005 sampled: 11/18/90 LC50: 59.2 %
95% fid. limits: 49.9 - 70.1 % slope: 8.3
comments:

Minewater

Rain Gauge

COMPANY: Detour Lake Mine - Placer Dome Inc., Detour Lake (28940005)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The Final Discharge is consistently lethal to Daphnia. The copper levels are normally above 0.1 mg/L and frequently above 0.3 mg/L. Cyanide may also contribute to the toxicity. Four Daphnia bioassays submitted to MOE under the MISA monitoring regulation in 1990, indicated the Final Discharge effluent was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure were 29.2, 2.3, 31.9, and 35.4 % effluent. An audit sample tested by MOE had an LC50 >100% effluent.

Final Discharge

```
03900142  sampled: 02/18/90     LC50:      29.2 %
  95% fid. limits:   23.9 -  46.7 % slope:     2.2
  comments:

03900382  sampled: 05/13/90     LC50:       2.3 %
  95% fid. limits:    1.1 -   3.3 % slope:     2.4
  comments:

02900156  sampled: 07/24/90     LC50:   >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

03900672  sampled: 08/12/90     LC50:      31.9 %
  95% fid. limits:   24.5 -  41.3 % slope:     6.0
  comments:

03901005  sampled: 11/18/90     LC50:      35.4 %
  95% fid. limits:   25.0 -  50.0 %
  comments:
```

Minewater

Rain Gauge

COMPANY: Dome Mine - Placer Dome Inc., Timmins (1170000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of three trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was acutely lethal to test fish. Statistically the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 82.8 %. High copper values (>.3mg/L) may be the cause. Of the remaining samples, one was non-lethal and the other produced a 96 hour LC50 > 100% effluent.

Final Discharge

03900195 sampled: 03/12/90 LC50: 82.8 %
95% fid. limits: 73.3 - 93.4 % slope: 15.6
comments:

01900033 sampled: 03/12/90 LC50: 0.0 - 0.0 %
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; INVALID 20% Cntrl. Mort.

03900467 sampled: 06/11/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 > 100

03900809 sampled: 09/11/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non lethal

COMPANY: Dome Mine - Placer Dome Inc., Timmins (1170000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the final discharge were consistently lethal to Daphnia. High copper values (>.3 mg/L) may be the cause. The data for three Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was acutely lethal to test animals. Statistically the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure were 11.7, 7.7, and 55.1 %. A MISA audit sample tested by MOE had an LC50 between 0 and 5% effluent.

Final Discharge

```
02900033  sampled: 03/12/90     LC50:        0.0 -   5.0  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

03900195  sampled: 03/12/90     LC50:       11.7 %
  95% fid. limits:    8.8 -  15.0 % slope:     5.7
  comments:

03900467  sampled: 06/11/90     LC50:        7.7 %
  95% fid. limits:    5.6 -  10.0 % slope:     6.2
  comments:

03900809  sampled: 09/11/90     LC50:       55.1 %
  95% fid. limits:   41.9 -  72.3 % slope:     4.2
  comments:
```

COMPANY: Dona Lake Mine - Placer Dome Inc., Pickle Lake (43440205)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for three trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish. Two audit samples were also non-lethal.

Final Discharge

```
04901216  sampled: 05/30/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

04901969  sampled: 06/27/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

01900176  sampled: 08/14/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal

04904678  sampled: 10/24/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

03910497  sampled: 08/27/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MOE Audit.  Effluent Hardness = 190 mg/l
```

COMPANY: Dona Lake Mine - Placer Dome Inc., Pickle Lake (43440205)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for three Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test animals. An audit sample tested by MOE had a "bell" shaped toxicity curve (see summary).

Final Discharge

04901216 sampled: 05/30/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

04901969 sampled: 06/27/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

02900176 sampled: 08/14/90 LC50: 0.0 - 5.0 %
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Bell-curve lethality

04904678 sampled: 10/24/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

COMPANY: ERG Resources-Giant Yellowknife Ltd, Timmins (37840402)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

One sample of North Tailings effluent was tested for acute toxicity to trout and resulted in a 96 hour LC50 > 100 % effluent. An audit sample tested by the MOE was determined as not acutely lethal to test fish.

```
North Tailings

 06901673  sampled: 10/15/90     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: 40% MORTALITY IN FULL STRENGTH EFFLUENT

 01900231  sampled: 10/16/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit; Non Lethal
```

COMPANY: ERG Resources-Giant Yellowknife Ltd, Timmins (37840402)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

One sample of North Tailings effluent was tested for acute toxicity to Daphnia and resulted in a 48 hour LC50 > 100 % effluent. An audit sample tested by the MOE had an LC50 of 78.7% effluent.

North Tailings

```
 06901674  sampled: 10/15/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HRS

 02900231  sampled: 10/16/90     LC50:       78.7 %
   95% fid. limits:   61.2 - 115.2 % slope:     5.1
   comments: MISA Audit\Oxygen produced by algae
```

COMPANY: Eastmaque Gold Mines Limited, Kirkland Lake (111350005)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

One sample of Final Discharge effluent was tested for acute toxicity to trout as required under the MISA monitoring regulations and resulted in a 96 hour LC50 > 100 % effluent. An audit sample tested by the MOE was determined as not acutely lethal to test fish.

Final Discharge

```
03900254  sampled: 03/30/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

03900546  sampled: 06/27/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments:

01900245  sampled: 10/31/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non Lethal

03901080  sampled: 12/19/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non lethal

03910628  sampled: 10/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Effluent Hardness = 190 mg/L; MOE Audit
```

COMPANY: Eastmaque Gold Mines Limited, Kirkland Lake (111350005)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

One sample of Final Discharge effluent was tested for acute toxicity to Daphnia as required under the MISA monitoring regulations and resulted in a 48 hour LC50 45.1 % effluent. An audit sample tested by the MOE was determined as not acutely lethal to test animals.

Final Discharge

```
03900254  sampled: 03/30/90     LC50:      45.1 %
  95% fid. limits:   35.9 -  56.6 % slope:     5.7
  comments:

03900546  sampled: 06/27/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

02900245  sampled: 10/30/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal

03901080  sampled: 12/19/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

03910628  sampled: 10/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Effluent Hardness = 190 mg/L; MOE Audit
```

COMPANY: Falconbridge - Falconbridge Ltd., Sudbury (1700004)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge at Ref.Rd was not acutely lethal to test fish. A MISA audit sample was also non-lethal.

Final Discharge at Ref.Rd

09900002 sampled: 02/20/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

09900008 sampled: 05/01/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

09900012 sampled: 08/21/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

09900017 sampled: 11/20/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

01910002 sampled: 01/08/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

COMPANY: Falconbridge - Falconbridge Ltd., Sudbury (1700004)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge at Ref.Rd was not acutely lethal to test animals. The other two samples had LC50s of >100% effluent. A MISA audit sample was also non-lethal. One of the submitted samples and the audit sample had "bell" shaped toxicity curve (see summary).

Final Discharge at Ref.Rd

```
 09902002  sampled: 02/20/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 09902008  sampled: 05/01/90     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments:

 09902012  sampled: 08/21/90     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments: high mortality in 15,45 and 60 conc.

 09902017  sampled: 11/20/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 02910002  sampled: 01/08/91     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit
```

COMPANY: Garson - Inco Ltd., Sudbury
(1690700)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater/culvert at St. effluent was acutely lethal to test fish. Statistically the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 80.6 %. Samples were measured with pH in excess of 10 near the time of the toxic sample. One of the remaining samples was non-lethal and the other two resulted in a 96 hour LC50 of > 100 % effluent.

```
Minewater/culvert at St.

 03900451  sampled: 06/05/90     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100

 03900808  sampled: 09/12/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03900992  sampled: 11/14/90     LC50:       80.6 %
   95% fid. limits:   65.0 - 100.0 %
   comments:

 03910069  sampled: 01/23/91     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100
```

COMPANY: Garson - Inco Ltd., Sudbury
(1690700)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater/culvert at St. effluent was acutely lethal to test animals. Statistically the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 70.7 %. Samples were measured with pH in excess of 10 near the time of the toxic sample. One of the remaining samples was non-lethal and the other two resulted in a 48 hour LC50s of > 100 % effluent. An audit sample tested by MOE was non-lethal.

Minewater/culvert at St.

```
  02900025  sampled: 02/26/90     non-lethal
    95% fid. limits:    0.0 -   0.0 %
    comments: MISA Audit

  03900451  sampled: 06/05/90     non-lethal
    95% fid. limits:    0.0 -   0.0 %
    comments: Non lethal

  03900808  sampled: 09/12/90     LC50:  >100   %
    95% fid. limits:    0.0 -   0.0 %
    comments: LC50 >100

  03900992  sampled: 11/14/90     LC50:      70.7 %
    95% fid. limits:   50.0 - 100.0 %
    comments:

  03910069  sampled: 01/23/91     LC50:  >100   %
    95% fid. limits:    0.0 -   0.0 %
    comments: LC50 >100
```

COMPANY: Geco Division - Noranda Minerals, Manitouwadge (1800002)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

Samples from the Final Discharge are normally lethal to trout. Copper values in excess of 0.1 mg/L are common. However, since the samples are more toxic to trout than to Daphnia, ammonia may contribute. Total ammonia nitrogen values from the discharge are commonly in excess of 50 mg/L. The data for four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to have been acutely lethal to test fish. Statistically the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure were 14.1 - 19.7% . An audit sample tested by the MOE was also determined acutely lethal with a 96 hour LC50 of 27.2 % effluent.

Final Discharge

04900639 sampled: 03/20/90 LC50: 14.1 %
95% fid. limits: 0.0 - 0.0 %
comments: Confidence limits are unreliable

04901633 sampled: 06/19/90 LC50: 14.1 %
95% fid. limits: 0.0 - 0.0 %
comments: Confidence limits are unreliable

04903832 sampled: 09/20/90 LC50: 14.1 %
95% fid. limits: 0.0 - 0.0 %
comments: Confidence limits are unreliable.

04904977 sampled: 11/14/90 LC50: 19.7 %
95% fid. limits: 16.5 - 23.3 %
comments:

01900262 sampled: 11/14/90 LC50: 27.2 %
95% fid. limits: 24.6 - 30.1 %
comments: MISA Audit

03910548 sampled: 09/17/91 LC50: 18.8 %
95% fid. limits: 14.6 - 24.2 % slope: 5.5
comments: MOE Audit. Effluent Hardness = 1980 mg/l

COMPANY: Geco Division - Noranda Minerals, Manitouwadge (1800002)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

Samples from the Final Discharge are consistently lethal to Daphnia. Copper values in excess of 0.1 mg/L are common. However, since the samples are more toxic to trout than to Daphnia, ammonia may contribute. Total ammonia nitrogen values from the discharge are commonly in excess of 50 mg/L. The data for four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to have been acutely lethal to test animals. Statistically the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure were 23.4, 17.8, 14.1, and 15.2 % . An audit sample tested by the MOE was also determined acutely lethal with a 48 hour LC50 of 26.7 % effluent.

Final Discharge

04900639 sampled: 03/20/90 LC50: 23.4 %
95% fid. limits: 21.4 - 25.5 %
comments:

04901633 sampled: 06/19/90 LC50: 17.8 %
95% fid. limits: 15.2 - 20.7 %
comments:

04903832 sampled: 09/20/90 LC50: 14.1 %
95% fid. limits: 0.0 - 0.0 %
comments: Confidence limits are unreliable.

02900262 sampled: 11/14/90 LC50: 26.7 %
95% fid. limits: 22.1 - 32.3 %
comments: MISA Audit; High conductivity

04904977 sampled: 11/14/90 LC50: 15.2 %
95% fid. limits: 11.0 - 21.0 %
comments:

03910548 sampled: 09/17/91 LC50: 54.7 %
95% fid. limits: 38.8 - 77.0 % slope: 3.2
comments: Effluent Hardness = 1980 mg/L; MOE Audit

COMPANY: Golden Giant Mine-Hemlo Gold Mines, Hemlo (42110205)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for a trout bioassay submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish.

Final Discharge

```
04904688  sampled: 10/24/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: non-lethal
```

COMPANY: Golden Giant Mine-Hemlo Gold Mines, Hemlo (42110205)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY
The data for a Daphnia bioassay submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent had an LC50 of >100% effluent.

Final Discharge

04904688 sampled: 10/24/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: 4 dead @ 100%

COMPANY: Kidd Creek Mine - Falconbridge Ltd., Kidd Township (990101)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples of the minewater are consistently lethal to trout. The pH of the effluent is normally well above 10 and sometimes over 12. High zinc values in excess of 1 mg/L are common. Occassionally copper values exceed 0.1 mg/L. The data for two trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was acutely lethal to test fish. Statistically the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure were 60.9 and 80.6%. A MISA audit sample was also lethal with a 96 hr LC50 of 80.6%.

Minewater

08900141 sampled: 02/22/90 LC50: 60.9 %
95% fid. limits: 51.1 - 72.5 %
comments:

08900651 sampled: 06/07/90 LC50: 80.6 %
95% fid. limits: 80.6 - 80.6 %
comments:

01910016 sampled: 01/16/91 LC50: 80.6 %
95% fid. limits: 65.0 - 100.0 %
comments: MISA Audit

COMPANY: Kidd Creek Mine - Falconbridge Ltd., Kidd Township (990101)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples of the minewater are commonly lethal to Daphnia. The pH of the effluent is normally well above 10 and sometimes over 12. High zinc values in excess of 1 mg/L are common. Occassionally copper values exceed 0.1 mg/L. The data for one of two Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was acutely lethal to test animals. Statistically the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 69.9 %. The other sample submitted had an LC50 of >100%. A MISA audit sample was also lethal with a 48 hr LC50 of between 60 and 100 % effluent.

Minewater

```
 08900142  sampled: 02/22/90     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments:

 08900652  sampled: 06/07/90     LC50:       69.9 %
   95% fid. limits:   69.9 -  69.9 %
   comments:

 02910016  sampled: 01/16/91     LC50:       60.0 - 100.0   %
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit; High Conductivity
```

COMPANY: Lacnor/Nordic - Rio Algom Ltd., Elliot Lake (1610302)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY
The data for three of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish. The remaining sample resulted in a 96 hour LC50s > 100 % effluent. Two audit samples tested by MOE were also non-lethal.

Final Discharge

```
03900240  sampled: 03/26/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

03900520  sampled: 06/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

01900174  sampled: 08/14/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal

03900852  sampled: 09/24/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non Lethal

03901072  sampled: 12/10/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

03910493  sampled: 08/27/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MOE Audit. Effluent Hardness = 1530 mg/l
```

COMPANY: Lacnor/Nordic - Rio Algom Ltd., Elliot Lake (1610302)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test animals. The remaining three samples resulted in a 48 hour LC50s > 100 % effluent. One audit sample tested by MOE had an LC50 of >100%.

Final Discharge

```
03900240  sampled: 03/26/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

03900520  sampled: 06/20/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

02900174  sampled: 08/14/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Very High Conductivity

03900852  sampled: 09/24/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non Lethal

03901072  sampled: 12/10/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100
```

COMPANY: Levack - Inco Ltd., Sudbury
(1690106)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the minewater commonly have high pH values (> 10) and are consistently lethal to trout except in June when a lower pH was measured. Nickel values in excess of 0.5 mg/L are common. The data for three of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent to have been acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure were 80.6, 80.6, and 80.6 %. The other sample was determined as not acutely lethal. An audit sample tested by the MOE was also determined acutely lethal with a 96 hour LC50 of 80.6 % effluent.

Minewater

```
 03900457  sampled: 06/06/90     non-lethal
   95% fid. limits:     0.0 -   0.0 %
   comments: Non-lethal

 01900144  sampled: 07/17/90     LC50:       80.6 %
   95% fid. limits:    65.0 - 100.0 %
   comments: MISA Audit

 03900798  sampled: 09/11/90     LC50:       80.6 %
   95% fid. limits:    65.0 - 100.0 %
   comments:

 03901056  sampled: 12/03/90     LC50:       80.6 %
   95% fid. limits:    65.0 - 100.0 %
   comments:

 03910052  sampled: 01/22/91     LC50:       80.6 %
   95% fid. limits:    65.0 - 100.0 %
   comments:
```

COMPANY: Levack - Inco Ltd., Sudbury
(1690106)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 70.7 %. Two of the other three samples were non-lethal and one had an LC50 of >100 %. One audit sample tested by the MOE had an LC50 of between 60 and 100% effluent and a second audit sample was non-lethal.

Minewater

```
03900457  sampled: 06/06/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non lethal

02900114  sampled: 06/14/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal;No corresponding Trout

02900144  sampled: 07/17/90     LC50:       60.0 - 100.0  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; High pH & Conductivity

03900798  sampled: 09/11/90     LC50:       70.7 %
  95% fid. limits:   50.0 - 100.0 %
  comments:

03901056  sampled: 12/03/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

03910052  sampled: 01/22/91     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100
```

COMPANY: Lockerby - Falconbridge Ltd., Sudbury (1700202)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was not acutely lethal to test fish. An MOE audit sample had an LC50 of >100% effluent.

Minewater

```
09900003  sampled: 02/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

09900007  sampled: 05/01/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

09900013  sampled: 08/21/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

09900018  sampled: 12/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

01910001  sampled: 01/07/91     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit
```

COMPANY: Lockerby - Falconbridge Ltd., Sudbury (1700202)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for three of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was not acutely lethal to the test animals. The remaining sample had an LC50 of >100%. An MOE audit sample was also non-lethal to the test animals.

Minewater

```
09902003  sampled: 02/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

09902007  sampled: 05/01/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

09902013  sampled: 08/21/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments:

09902018  sampled: 11/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

02910001  sampled: 01/07/91     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; High Conductivity
```

COMPANY: Macassa Division - LAC Minerals Ltd, Kirkland Lake (1410000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge was not acutely lethal to test fish. However, one of the remaining samples was determined acutely lethal. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 72.7 %. Samples with very high copper were collected in the early 1990 (well over 0.3 mg/L). Cyanide values were also high during the same period. The other sample produced a 96 hour LC50 > 100 % effluent. Two audit samples tested by MOE were non-lethal to trout.

Final Discharge

```
 03900245  sampled: 03/27/90     LC50:       72.7 %
   95% fid. limits:   60.6 -  87.1 % slope:     8.1
   comments:

 03900528  sampled: 06/26/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non lethal

 03900853  sampled: 09/26/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03901081  sampled: 12/18/90     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100

 03910056  sampled: 01/22/91     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Effluent Hardness = 580 mg/L; MOE Audit

 03910462  sampled: 08/13/91     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Effluent Hardness = 680 mg/L; MOE Audit
```

COMPANY: Macassa Division - LAC Minerals Ltd, Kirkland Lake (1410000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the final discharge were often lethal to Daphnia. High copper and cyanide may contribute to the toxicity. The data for three of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure were 4.9, 70.7, and 70.7 %. The other sample was non-lethal. One audit sample tested by MOE was non-lethal to Daphnia, while another had an LC50 of >100% effluent.

Final Discharge

```
 03900245  sampled: 03/27/90     LC50:       4.9 %
   95% fid. limits:    3.7 -   6.4 % slope:     5.3
   comments:

 03900528  sampled: 06/26/90     LC50:      70.7 %
   95% fid. limits:   50.0 - 100.0 %
   comments:

 03900853  sampled: 09/26/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03901081  sampled: 12/18/90     LC50:      70.7 %
   95% fid. limits:   50.0 - 100.0 %
   comments:

 03910056  sampled: 01/22/91     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments: Effluent Hardness =580 mg/L; MOE Audit

 03910462  sampled: 08/13/91     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: MOE Audit. Effluent Hardness = 680 mg/l
```

COMPANY: Magnacon Mine-Muscocho Explorations, Mishibishu Lake Wa
(110980208)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

An audit sample of the Final Discharge was tested by the MOE and was determined not acutely lethal to test fish.

Final Discharge

01900082 sampled: 05/03/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

03910636 sampled: 10/29/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Effluent Hardness = 50 mg/L; MOE Audit

COMPANY: Magnacon Mine-Muscocho Explorations, Mishibishu Lake
(110980208)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

An audit sample of the Final Discharge was tested by the MOE and was determined not acutely lethal to Daphnia.

Final Discharge

02900082 sampled: 05/01/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

COMPANY: Majino Mine-Muscocho Explorations, Finan Township Goudr
(110980109)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

An audit sample of the Final Discharge was tested by MOE and was not acutely lethal to trout.

Final Discharge

03910322 sampled: 05/29/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MOE Audit; Effluent Hardness = 110 mg/l

03910614 sampled: 10/15/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Effluent Hardness = 110 mg/L; MOE Audit

Minewater

Rain Gauge

COMPANY: Majino Mine-Muscocho Explorations, Finan Township Gou
(110980109)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY
Two audit samples of the Final Discharge were tested by MOE and found not acutely lethal to Daphnia.

Final Discharge

03910322 sampled: 05/28/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Effluent Hardness = 110 mg/L; MOE Audit

03910614 sampled: 10/15/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Effluent Hardness = 110 mg/L; MOE Audit

Minewater

Rain Gauge

COMPANY: Marhill - Canamax Resources Inc., Timmins (46950200)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 77.6 %. Potential causes of this toxicity are unknown. The other three samples, when tested, resulted in 96 hour LC50s > 100 % effluent. An audit sample tested by the MOE was determined as not acutely lethal and another audit had an LC50 of >100%.

Minewater

06900415 sampled: 03/20/90 LC50: 77.6 %
95% fid. limits: 67.6 - 91.8 %
comments: 90% MORTALITY IN FULL STRENGTH SAMPLE

06900781 sampled: 06/20/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: 40% MORTALITY IN THE 65% CONCENTRATION

01900182 sampled: 08/21/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Non-lethal

06901458 sampled: 09/18/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: 30% MORTALITY IN FULL STRENGTH EFFLUENT

06902112 sampled: 12/11/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: 30% MORTALITY IN FULL STRENGTH EFFLUENT.

03910492 sampled: 08/27/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MOE Audit. Effluent Hardness = 360 mg/l

COMPANY: Marhill - Canamax Resources Inc., Timmins (46950200)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent were non-lethal. An audit sample tested by the MOE was also not acutely lethal.

Minewater

06900416 sampled: 03/20/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HRS

06900782 sampled: 06/20/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: NO MORTALITY OR IMMOBILITY OBSERVED DURING TE

02900181 sampled: 08/21/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Non-lethal

06901459 sampled: 09/18/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HRS

06902113 sampled: 12/11/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HRS

COMPANY: McDermott-American Barrick Res.Corp, Harker Township
(108920000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

An audit sample of the Final Discharge effluent, when tested by the MOE, was determined as non-lethal to trout.

Final Discharge

```
01900085  sampled: 05/08/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal
```

COMPANY: McDermott-American Barrick Res.Corp, Harker Township
(108920000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

An audit sample of the Final Discharge effluent, when tested by the MOE, was non-lethal to Daphnia.

Final Discharge

```
02900085  sampled: 05/08/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Low Conductivity
```

COMPANY: Metallurgical Site-Falconbridge Ltd, Hoyle Township (990002)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY
The data for two of three trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge was not acutely lethal to test fish. The remaining sample was acutely lethal. Statistically, the percentage effluent required to kill 50% of the test fish by the end of the four days exposure was 80.6 %. An audit sample tested by the MOE was determined acutely lethal with a 96 hour LC50 of 80.6 % effluent. High pH, above 10, could be the cause. Also zinc values were frequently above 0.5 mg/L.

Final Discharge

08900143 sampled: 02/21/90 LC50: 80.6 %
95% fid. limits: 80.6 - 80.6 %
comments:

08900653 sampled: 06/05/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

01900190 sampled: 09/04/90 LC50: 80.6 %
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

08901501 sampled: 11/06/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: TEST CONDUCTED BY NEIL KARROW.

COMPANY: Metallurgical Site-Falconbridge Ltd, Hoyle Township (990002)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one Daphnia bioassay submitted to MOE under the MISA monitoring regulation indicated the Final Discharge was lethal to Daphnia. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 37.6 %. An audit sample tested by the MOE was determined acutely lethal with a 48 hour LC50 of between 60 and 100 % effluent. High pH, consistently above 10, could be the cause. Also zinc values were frequently above 0.5 mg/L.

Final Discharge

```
02900190  sampled: 09/04/90     LC50:       60.0 - 100.0  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

08901502  sampled: 11/06/90     LC50:       37.6 %
  95% fid. limits:   29.8 -  46.9 % slope:     7.8
  comments: TEST CONDUCTED BY NEIL KARROW.
```

COMPANY: Muskegsagagen Lake-Bond Gold Canada, District of Kenora
(112110002)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for three of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish. One sample was lethal to fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 80.6%. The cause of the toxicity is unknown although high concentrations of organics are commonly present and one of the Daphnia tests had a "bell" shaped toxicity curve. Two audit samples tested by the MOE were also non-lethal.

Final Discharge

04901053 sampled: 05/05/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: non-lethal

04902833 sampled: 07/31/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: non-lethal

01900175 sampled: 08/14/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Non-lethal

04904851 sampled: 11/03/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

04911323 sampled: 03/11/91 LC50: 80.6 %
95% fid. limits: 0.0 - 0.0 %
comments:

03910496 sampled: 08/27/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MOE Audit. Effluent Hardness = 440 mg/l

COMPANY: Muskegsagagen Lake-Bond Gold Canada, District of Ke
(112110002)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for three of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test animals. One sample had an LC50 of >100 %. An audit sample tested by the MOE had a "bell" shaped toxicity curve (see summary). The cause of the toxicity is unknown although high concentrations of organics are commonly present.

Final Discharge

```
 04901053  sampled: 05/05/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 04902833  sampled: 07/31/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: non-lethal

 02900175  sampled: 08/14/90     LC50:        0.0 -   5.0  %
   95% fid. limits:    0.0 -   0.0 %
   comments: Bell-curve lethality

 04904851  sampled: 11/03/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 04911323  sampled: 03/11/91     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: 2 dead @ 100%
```

COMPANY: Nickel Refinery - Inco Ltd., Sudbury (1690403)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Discharge of the Second Pond was not acutely lethal to test fish. One sample when tested resulted in a 96 hour LC50 > 100 % effluent and another in an LC50 of 72.7 %. Potential causes are high pH, high copper and high nickel.

```
Discharge / second pond

 03900436  sampled: 06/04/90     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100

 03900791  sampled: 09/10/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03900978  sampled: 11/12/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03910039  sampled: 01/21/91     LC50:      72.7 %
   95% fid. limits:   60.6 -  87.1 % slope:     8.1
   comments:
```

COMPANY: Nickel Refinery - Inco Ltd., Sudbury (1690403)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for three of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Discharge/ Second Pond effluent was not acutely lethal to test animals. One sample when tested resulted in a 48 hour LC50 > 100 % effluent and had a "bell" shaped toxicity curve.

Discharge / second pond

```
 03900436  sampled: 06/04/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non lethal

 03900791  sampled: 09/10/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03900978  sampled: 11/12/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03910039  sampled: 01/21/91     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: Lethal; LC50 indeterminate <100%
```

COMPANY: Nolin Creek Treatment Plant - Inco, Sudbury (1690601)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of three trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish. One sample when tested resulted in a 96 hour LC50 > 100 % effluent and another had an LC50 of 80.6%. High concentrations of copper and nickel and high pH may contribute to the toxicity. An audit sample tested by the MOE was determined as acutely lethal to test fish. The 96 hour LC50 was measured to be 80.1 % effluent.

Final Discharge

03900840 sampled: 09/24/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 >100

05900210 sampled: 10/09/90 LC50: 80.1 %
95% fid. limits: 69.6 - 92.4 %
comments: MISA audit sample

03900977 sampled: 11/12/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

03910040 sampled: 01/21/91 LC50: 80.6 %
95% fid. limits: 65.0 - 100.0 %
comments:

COMPANY: Nolin Creek Treatment Plant - Inco, Sudbury (1690601)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test animals. The other two samples had LC50s of between 50 and 100 % effluent. High concentrations of copper and nickel and high pH may contribute to the toxicity. An audit sample tested by the MOE was determined as acutely lethal to test animals. The 48 hour LC50 was measured to be 83.3 % effluent.

Final Discharge

```
03900437  sampled: 06/04/90     LC50:       50.0 - 100.0  %
  95% fid. limits:    0.0 -    0.0 %
  comments: Lethal; LC50 Range 50% - 100%

03900840  sampled: 09/24/90     non-lethal
  95% fid. limits:    0.0 -    0.0 %
  comments: Non-lethal

05900210  sampled: 10/09/90     LC50:       83.3 %
  95% fid. limits:   37.2 - 999.9 %
  comments: MISA audit sample.

03900977  sampled: 11/12/90     non-lethal
  95% fid. limits:    0.0 -    0.0 %
  comments: Non-lethal

03910040  sampled: 01/21/91     LC50:       50.0 - 100.0  %
  95% fid. limits:    0.0 -    0.0 %
  comments: LC50 Range
```

COMPANY: Onaping - Falconbridge Ltd., Sudbury
(1700103)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the discharge of the mine pond are consistently lethal to trout. Total ammonia nitrogen in excess of 18 mg/l as well as high pH are the probable causes. The samples are more toxic to trout than to Daphnia. The data for four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Discharge/ mine pond effluent to have been acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure ranged from 17.3 - 68.8 %. Two audit samples tested by the MOE were determined to be acutely lethal. The 96 hour LC50s were 47.4 and 54.7 % effluent.

Discharge / mine pond

```
09900004  sampled: 02/20/90     LC50:       41.7 %
  95% fid. limits:   39.5 -  43.9 %
  comments:

01900060  sampled: 04/02/90     LC50:       47.4 %
  95% fid. limits:   42.9 -  52.3 %
  comments: MISA Audit

09900005  sampled: 05/01/90     LC50:       17.3 %
  95% fid. limits:    0.0 -   0.0 %
  comments:

09900014  sampled: 08/21/90     LC50:       48.5 %
  95% fid. limits:   42.5 -  45.0 %
  comments: 100% mortality in 100% conc. after 15 minutes

09900019  sampled: 11/20/90     LC50:       68.8 %
  95% fid. limits:   65.5 -  72.2 %
  comments: 0 % alpha used

01910175  sampled: 08/14/91     LC50:       54.7 %
  95% fid. limits:   48.0 -  62.2 %
  comments: MISA Audit
```

COMPANY: Onaping - Falconbridge Ltd., Sudbury (1700103)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the discharge of the mine pond were frequently lethal to Daphnia. Total ammonia nitrogen in excess of 18 mg/l as well as high pH are the probable causes. The samples are more toxic to trout than to Daphnia. The data for two of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Discharge/ mine pond effluent to have been acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 54.5 and 54.9 %. The other two submitted samples had LC50s >100% effluent. An audit sample tested by the MOE was acutely lethal. The 48 hour LC50s was 66.6 % effluent.

Discharge / mine pond

```
09902004  sampled: 02/20/90     LC50:       54.5 %
  95% fid. limits:   45.9 -  64.7 %
  comments:

02900060  sampled: 04/02/90     LC50:       66.6 %
  95% fid. limits:   57.3 -  77.5 %
  comments: MISA Audit; High conductivity

09902005  sampled: 05/01/90     LC50:       54.9 %
  95% fid. limits:   42.7 -  70.5 %
  comments: high pH

09902014  sampled: 08/21/90     LC50:   >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments:

09902019  sampled: 11/20/90     LC50:   >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments:
```

COMPANY: Pamour #1-Giant Yellowknife Mines, Timmins
(1090109)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Decant Weir # 2 effluent was acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 6.9 %. High concentrations of Nickel, copper, and cyanide coincide with the time of this sample. The sample was slightly more toxic to trout than to Daphnia. One of the two remaining samples had a measured LC50 > 100 % effluent and the other two were determined non-lethal.

The data for one trout bioassay submitted to MOE under the MISA monitoring regulation indicated the Decant Weir # 1A effluent was acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 41.8 %. The cause of the toxicity is unknown. An audit sample of the Decant Weir 1A was tested by the MOE and determined as not acutely lethal.

Decant Weir # 2

```
06900448  sampled: 03/28/90     LC50:        6.9 %
  95% fid. limits:    5.4 -   8.8 %
  comments: 90% MORTALITY IN 10% TESTS CONCENTRATION

06900626  sampled: 05/23/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MORTALITY AT 50, 65 AND 100% CONCENTRATIONS

06900943  sampled: 07/16/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO MORTALITY OR SUBLETHAL IMPAIRMENT OBSERVED

06901669  sampled: 10/15/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO MORTALITY OR SUBLETHAL IMPAIRMENT OBSERVED
```

Pamour #1-Giant Yellowknife Mines (continued)

Decant Weir 1A

03900782 sampled: 09/10/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA audit sample.

06901671 sampled: 10/15/90 LC50: 41.8 %
95% fid. limits: 37.9 - 46.1 %
comments: 80% MORTALITY IN 50% TEST CONCENTRATION.

Rain Gauge

Decant Weir # 1

COMPANY: Pamour #1-Giant Yellowknife Mines, Timmins (1090109)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Decant Weir # 2 effluent was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 19.7 %. High concentrations of Nickel, copper, and cyanide coincide with the time of this sample. The sample was slightly more toxic to trout than to Daphnia. The three remaining samples were non-lethal.

The data for one Daphnia bioassay submitted to MOE under the MISA monitoring regulation indicated the Decant Weir # 1A effluent was non-lethal to test animals. An audit sample of the Decant Weir 1A was tested by the MOE and determined as not acutely lethal.

Decant Weir # 2

```
06900449  sampled: 03/28/90     LC50:       19.7 %
  95% fid. limits:   16.5 -  23.3 %
  comments: 40% MORTALITY IN 20% TEST CONCENTRATION

06900627  sampled: 05/23/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HOU

06900946  sampled: 07/16/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HRS

06901670  sampled: 10/15/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HRS
```

Decant Weir 1A

```
03900782  sampled: 09/10/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA audit sample.

06901672  sampled: 10/15/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO MORTALITY OR IMMOBILITY OBSERVED IN 48 HRS
```

COMPANY: Panel - Rio Algom Ltd., Elliot Lake (1670207)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish. The other three samples, when tested, resulted in 96 hour LC50s > 100 % effluent. An audit sample tested by the MOE had an LC50 of >100% effluent.

Final Discharge

```
03900242  sampled: 03/26/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 >100

03900562  sampled: 07/03/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 >100

01900151  sampled: 07/24/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: MISA Audit

03900851  sampled: 09/24/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 >100

03901073  sampled: 12/10/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Non-lethal
```

COMPANY: Panel - Rio Algom Ltd., Elliot Lake
(1670207)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for three of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test animals. The other sample, when tested, resulted in 48 hour LC50s > 100 % effluent. An audit sample tested by the MOE had an LC50 of >100%.

Final Discharge

03900242 sampled: 03/26/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

03900562 sampled: 07/03/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 >100

02900151 sampled: 07/24/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Very High Conductivity

03900851 sampled: 09/24/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non Lethal

03901073 sampled: 12/10/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

COMPANY: Pronto - Rio Algom Ltd., Spragge (1610500)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of three trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge was acutely lethal to test fish. The remaining sample, when tested, resulted in a 96 hour LC50 > 100 % effluent. An audit sample was tested by MOE and was non-lethal.

Final Discharge

```
03900241  sampled: 03/26/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

05900097  sampled: 04/30/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

03900521  sampled: 06/20/90     LC50:  >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

03901069  sampled: 12/10/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal
```

COMPANY: Pronto - Rio Algom Ltd., Spragge (1610500)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of three Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge was not acutely lethal to test animals. An audit sample tested by MOE was non-lethal.

Final Discharge

03900241 sampled: 03/26/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

05900097 sampled: 04/30/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA audit sample.

03900521 sampled: 06/20/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 >100

03901069 sampled: 12/10/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

COMPANY: Quirke - Rio Algom Ltd., Elliot Lake (1670108)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final discharge effluent to have been acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure were 31.9 and 80.6 %. Ammonia is a probable cause. One of the remaining two samples had a 96 hour LC50 > 100 % effluent and the other was non-lethal. One audit sample tested by the MOE was non-lethal and another had an LC50 of >100%.

Final Discharge

```
03900243  sampled: 03/26/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

03900545  sampled: 06/25/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: 100% mortality @ 40% effluent conc.

01900173  sampled: 08/13/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

03900850  sampled: 09/24/90     LC50:       31.9 %
  95% fid. limits:   23.1 -  43.8 % slope:      5.6
  comments:

03901071  sampled: 12/10/90     LC50:       80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:

03910494  sampled: 08/28/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MOE Audit. Effluent Hardness = 2130
```

COMPANY: Quirke - Rio Algom Ltd., Elliot Lake (1670108)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final discharge effluent was non-lethal to test animals. The other three samples had LC50s of >100 % effluent. One audit sample tested by the MOE had a "bell" shaped toxicity curve (see summary).

Final Discharge

```
 03900243  sampled: 03/26/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: Non-lethal

 03900545  sampled: 06/25/90     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100

 02900173  sampled: 08/13/90     LC50:      48.5 %
   95% fid. limits:   37.0 -  75.2 % slope:     4.9
   comments: MISA Audit; Bell-curve lethality

 03900850  sampled: 09/24/90     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100

 03901071  sampled: 12/10/90     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50 >100
```

COMPANY: Refinery - Cameco, Blind River
(820308)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the refinery final discharge are consistently lethal to trout. Potential causes are unknown. The data for a trout bioassay submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to had been acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 10.9 %. An Audit sample was determined to have an LC50 of 32.3 % effluent.

Final Discharge

16900029 sampled: 10/17/90 LC50: 10.9 %
95% fid. limits: 10.0 - 11.7 %
comments: TRIMMED SPEARMAN KARBER ALPH-0

01910010 sampled: 01/14/91 LC50: 32.3 %
95% fid. limits: 29.4 - 36.3 %
comments: MISA audit sample.

COMPANY: Refinery - Cameco, Blind River
(820308)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the refinery final discharge are consistently lethal to Daphnia. Potential causes are unknown. The data for a Daphnia bioassay submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 18.9, 27.7, and 14.1 %. An Audit sample was determined to have an LC50 of 2.4 % effluent.

Final Discharge

```
16900017  sampled: 06/21/90     LC50:       18.9 %
  95% fid. limits:   24.1 -  14.7 %
  comments: ALPHA - 0

16900023  sampled: 10/17/90     LC50:       27.7 %
  95% fid. limits:   23.2 -  32.8 %
  comments: ALPHA - 0

02910010  sampled: 01/14/91     LC50:        2.4 %
  95% fid. limits:    0.0 -   5.5 % slope:     2.1
  comments: MISA audit sample.

16910038  sampled: 01/16/91     LC50:       14.1 %
  95% fid. limits:   10.6 -  18.7 %
  comments: ALPHA IS ZERO
```

COMPANY: Refinery - Inco Ltd., Port Colborne (1600105)
SECTOR: Metal Mining
REGION: West Central

SUMMARY

Samples from the final discharge of the refinery are consistently lethal to trout. Probable causes include high copper concentrations and high pH levels. The data for four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to had been acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure ranged from 60.0 - 100 % . Two audit samples tested by the MOE were acutely lethal with a 96 hour LC50s of 55.0 and 51.0 % effluent.

Final Discharge

```
03900448  sampled: 06/05/90     LC50:        65.0 - 100.0  %
  95% fid. limits:    0.0 -   0.0 %
  comments: Lethal; LC50 Range  65% - 100%

03900799  sampled: 09/11/90     LC50:        80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:

01900210  sampled: 09/24/90     LC50:        55.0 %
  95% fid. limits:   47.9 -  63.3 %
  comments: MISA Audit

03900984  sampled: 11/13/90     LC50:        60.0 %
  95% fid. limits:   40.0 -  65.0 %
  comments:

03910049  sampled: 01/22/91     LC50:        80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:

01910253  sampled: 10/15/91     LC50:        51.0 %
  95% fid. limits:   40.0 -  65.0 %
  comments: MISA Audit
```

COMPANY: Refinery - Inco Ltd., Port Colborne (1600105)
SECTOR: Metal Mining
REGION: West Central

SUMMARY

Samples from the final discharge of the refinery are consistently lethal to Daphnia. Probable causes include high copper concentrations and high pH levels. The data for three of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure ranged between 50 and 100 % . One audit sample tested by the MOE were acutely lethal with a 48 hour LC50s of 60.3 % effluent.

Final Discharge

03900448 sampled: 06/05/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 >100

03900799 sampled: 09/11/90 LC50: 50.0 - 100.0 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 Range

02900210 sampled: 09/24/90 LC50: 60.3 %
95% fid. limits: 50.8 - 71.5 %
comments: MISA Audit; High Conductivity

03900984 sampled: 11/13/90 LC50: 70.7 %
95% fid. limits: 50.0 - 100.0 %
comments:

03910049 sampled: 01/22/91 LC50: 70.7 %
95% fid. limits: 50.0 - 100.0 %
comments:

COMPANY: Refinery - Cameco, Port Hope
(820001)
SECTOR: Metal Mining
REGION: Central

SUMMARY
The data for four sets of trout bioassays submitted to MOE under the MISA monitoring regulation indicated the West UF6, the East UF6, and the UO2 Discharges were not acutely lethal to test fish. One audit sample tested by MOE from the West UF6 discharge had an LC50 of >100% effluent.

West UF6 Discharge

```
16900002  sampled: 03/21/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC50 SINCE >50% SURVIVAL AT 100% CONC.

16900010  sampled: 06/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC50 DUE TO > 50% SURVIVAL AT 100% CONC.

16900034  sampled: 10/31/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC-50 DUE TO >50% SURVIVAL 100% CONC.

01900252  sampled: 11/06/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

16910053  sampled: 01/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: LC-50 > 100%
```

East UF6 Discharge

```
16900003  sampled: 03/21/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC50 AS >50% SURVIAL AT 100% COMC.

16900011  sampled: 06/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC50 DUE TO > 50% SURVIVAL AT 100% CONC.

16900035  sampled: 10/31/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC-50 DUE TO >50% SURVIVAL 100% CONC.

16910052  sampled: 01/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: LC-50 > 100%
```

Refinery - Cameco (continued)

UO2 Discharge

```
 16900004  sampled: 03/21/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: NO LC50 SINCE >50% SURVIVAL AT 100% CONC.

 16900012  sampled: 06/20/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: NO LC50 DUE TO > 50% SURVIVAL AT 100% CONC.

 16900036  sampled: 10/31/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: NO LC-50 DUE TO >50% SURVIVAL AT 100% CONC.

 16910051  sampled: 01/22/91     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: LC-50 > 100%
```

Rain Gauge

COMPANY: Refinery - Cameco, Port Hope
(820001)
SECTOR: Metal Mining
REGION: Central

SUMMARY

The data for four sets of Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the West UF6, East UF6, and the U02 Discharge were not acutely lethal to test animals. An audit from the West UF6 discharge had an LC50 of >100%.

West UF6 Discharge

```
16900002  sampled: 03/21/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC50 SINCE >50% SURVIVAL AT 100% CONC.

16900009  sampled: 06/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC50 DUE TO > 50% SURVIVAL AT 100% CONC.

16900027  sampled: 10/31/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC-50 DUE TO >50% SURVIVAL 100% CONC.

02900252  sampled: 11/06/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

16910042  sampled: 01/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50>100%
```

East UF6 Discharge

```
16900003  sampled: 03/21/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NI LC50 SINCE >50% SURVIVAL AT 100% CONC.

16900010  sampled: 06/20/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC50 DUE TO > 50% SURVIVAL AT 100% CONC.

16900028  sampled: 10/31/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: NO LC-50 DUE TO >50% SURVIVAL 100% CONC.

16910041  sampled: 01/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50>100%
```

Refinery - Cameco (continued)

UO2 Discharge

```
 16900004  sampled: 03/21/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: NO LC50 SINCE >50% SURVIVAL AT 100% CONC.

 16900011  sampled: 06/20/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: NO LC50 DUE TO > 50% SURVIVAL AT 100% CONC.

 16900029  sampled: 10/31/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: NO LC-50 DUE TO >50% SURVIVAL AT 100% CONC.

 16910040  sampled: 01/22/91     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: LC50>100%
```

Rain Gauge

COMPANY: Renabie Gold Mines Ltd., Renabie (77400000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the final discharge are commonly lethal to trout. The most probable cause is copper well in excess of 0.1 mg/L. Potential contributors are zinc and cyanide. The data for two trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to have been acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure were 1.7 and 14.9 %. An audit sample tested by the MOE was determined as not acutely lethal.

Final Discharge

04901091 sampled: 05/21/90 LC50: 1.7 %
95% fid. limits: 1.4 - 1.9 %
comments:

03900780 sampled: 09/05/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Hardness (EDTA) = 180 mg/L; MOE audit sample

04904406 sampled: 10/15/90 LC50: 14.9 %
95% fid. limits: 13.4 - 16.5 %
comments: OCT QUARTERLY RESUBMISSION

Minewater

Rain Gauge

COMPANY: Renabie Gold Mines Ltd., Renabie
(77400000)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

Samples from the final discharge are commonly lethal to Daphnia. The most probable cause is copper well in excess of 0.1 mg/L. Potential contributors are zinc and cyanide. The data for two of three Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to have been acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure were 16.9 and 14.1 %. The third sample was not acutely lethal. An audit sample tested by MOE had an LC50 of 51.4% effluent.

Final Discharge

```
 04901091  sampled: 05/21/90     LC50:      16.9 %
   95% fid. limits:   13.1 -  21.5 %
   comments:

 04903054  sampled: 08/15/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 03900780  sampled: 09/05/90     LC50:      51.4 %
   95% fid. limits:   39.1 -  69.1 % slope:     4.6
   comments: Hardness (EDTA) = 180 mg/L; MOE audit sample

 04904406  sampled: 10/15/90     LC50:      14.1 %
   95% fid. limits:   12.0 -  16.5 %
   comments: Oct Quarterly Report
```

Minewater

Rain Gauge

COMPANY: Shebandowan Property - Inco Ltd., Thunder Bay (1690908)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to have been not acutely lethal to test fish. Two audit samples tested by the MOE were also not acutely lethal.

Final Discharge

04903569 sampled: 09/11/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

01900241 sampled: 10/29/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Non Lethal

04904954 sampled: 11/13/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: non-lethal

04910358 sampled: 01/22/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: non-lethal

04913178 sampled: 06/18/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

01910146 sampled: 07/22/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit; Non-lethal

COMPANY: Shebandowan Property - Inco Ltd., Thunder Bay (1690908)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent to have been not acutely lethal to test animals. An audit sample tested by the MOE was also determined as not acutely lethal and another audit had an LC50 of >100% effluent.

Final Discharge

```
04903569  sampled: 09/11/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

02900241  sampled: 10/29/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit

04904954  sampled: 11/13/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: non-lethal

04910358  sampled: 01/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: non-lethal

04913178  sampled: 06/18/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

02910146  sampled: 07/22/91     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal
```

COMPANY: St. Andrews Gold Fields, Stock Township (112180104)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one trout bioassay submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was not acutely lethal to test fish. An audit sample tested by the MOE was also non-lethal.

Minewater

05900209 sampled: 10/02/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments:

01900264 sampled: 11/14/90 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

COMPANY: St. Andrews Gold Fields, Stock Township (112180104)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one Daphnia bioassay submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was not acutely lethal to test animals. An audit sample tested by the MOE was also non-lethal.

Minewater

```
05900209  sampled: 10/02/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments:

02900264  sampled: 11/14/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal
```

COMPANY: Stanleigh - Rio Algom Ltd., Elliot Lake (1670306)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for two of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish. The remaining two samples resulted in 96 hour LC50s > 100 % effluent. An audit sample tested by the MOE had an LC50 of >100% effluent.

Final Discharge

```
03900244  sampled: 03/26/90     LC50:  >100  %
  95% fid. limits:    0.0 -    0.0 %
  comments: LC50 >100

03900544  sampled: 06/25/90     LC50:  >100  %
  95% fid. limits:    0.0 -    0.0 %
  comments: LC50 >100

01900172  sampled: 08/14/90     LC50:  >100  %
  95% fid. limits:    0.0 -    0.0 %
  comments: MISA Audit

03900849  sampled: 09/24/90     non-lethal
  95% fid. limits:    0.0 -    0.0 %
  comments: Non Lethal

03901070  sampled: 12/10/90     non-lethal
  95% fid. limits:    0.0 -    0.0 %
  comments: Non-lethal

03910552  sampled: 09/18/91     non-lethal
  95% fid. limits:    0.0 -    0.0 %
  comments: Effluent Hardness = 1480 mg/L; MOE Audit
```

COMPANY: Stanleigh - Rio Algom Ltd., Elliot Lake (1670306)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY
The data for three of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test animals. The remaining sample resulted in 48 hour LC50s > 100 % effluent. An audit sample tested by the MOE had a "bell" shaped toxicity curve (see summary).

Final Discharge

```
03900244  sampled: 03/26/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Non-lethal

03900544  sampled: 06/25/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Non-lethal

02900172  sampled: 08/14/90     LC50:        1.7 %
  95% fid. limits:     1.7 -  15.4 %
  comments: MISA Audit; Bell-shaped lethality

03900849  sampled: 09/24/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: LC50 >100

03901070  sampled: 12/10/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Non-lethal

03910552  sampled: 09/18/91     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Effluent Hardness = 1480 mg/L; MOE Audit
```

COMPANY: Stanrock Property-Denison Mines Ltd, Elliot Lake (1680206)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 80.6 %. The cause of this toxicity is unknown. Of the remaining samples, two resulted in a 96 hour LC50 > 100 % effluent, the other was non-lethal. An audit sample tested by the MOE had an LC50 of >100% effluent.

Final Discharge

03900260 sampled: 04/02/90 LC50: 80.6 %
95% fid. limits: 65.0 - 100.0 %
comments:

01900083 sampled: 05/08/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: MISA Audit

03900559 sampled: 07/03/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 > 100

03900873 sampled: 10/01/90 LC50: >100 %
95% fid. limits: 0.0 - 0.0 %
comments: LC50 > 100

03910002 sampled: 01/07/91 non-lethal
95% fid. limits: 0.0 - 0.0 %
comments: Non-lethal

COMPANY: Stanrock Property-Denison Mines Ltd, Elliot Lake (1680206)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was between 50 and 100 %. The cause of this toxicity is unknown. Of the remaining samples, two resulted in a 48 hour LC50 > 100 % effluent, the other was non-lethal. An audit sample tested by the MOE had an LC50 between 60 and 100% effluent.

Final Discharge

```
03900260  sampled: 04/02/90     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100

02900083  sampled: 05/08/90     LC50:      60.0 - 100.0  %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; High Conductivity

03900559  sampled: 07/03/90     LC50:      50.0 - 100.0  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 Range 50 - 100

03900873  sampled: 10/01/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal

03910002  sampled: 01/07/91     LC50:  >100  %
  95% fid. limits:    0.0 -   0.0 %
  comments: LC50 >100
```

COMPANY: Strathcona(Moose Lake)-Falconbridge, Sudbury (1700301)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY
The data for four trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge/Fecunis effluent was not acutely lethal to test fish. One audit sample tested by the MOE had an LC50 of >100% effluent, the other was non-lethal.

Final Discharge / Fecunis

```
 09900001  sampled: 02/20/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 01900059  sampled: 04/02/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit

 09900006  sampled: 05/01/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 09900011  sampled: 08/21/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 09900016  sampled: 11/20/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 01910174  sampled: 08/14/91     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit
```

COMPANY: Strathcona(Moose Lake)-Falconbridge, Sudbury (1700301)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of four Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge/Fecunis effluent was not acutely lethal to test animals. One sample submitted had an LC50 of 5.4% effluent. Contributing may have been high levels of copper and nickel. Two of the other samples had LC50s >100%. Two audit samples tested by MOE were also not acutely lethal.

```
Final Discharge / Fecunis

 09902001  sampled: 02/20/90     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments:

 02900059  sampled: 04/02/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit; High Conductivity

 09902006  sampled: 05/01/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 09902011  sampled: 08/21/90     LC50:        5.4 %
   95% fid. limits:    1.9 -  15.2 %
   comments:

 09902016  sampled: 11/20/90     LC50:  >100   %
   95% fid. limits:    0.0 -   0.0 %
   comments:

 02910174  sampled: 08/14/91     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit; Non-lethal
```

COMPANY: Whistle - Inco Ltd., Sudbury
(1603109)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of two trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was acutely lethal to test fish. Statistically, the percentage effluent required to kill 50% of the test fish by the end of the four days exposure was 80.6%. The cause of this toxicity is probably high pH. The remaining sample was non-lethal. An audit sample tested by MOE was also non-lethal.

Minewater

```
03900450  sampled: 06/05/90     LC50:      80.6 %
  95% fid. limits:   65.0 - 100.0 %
  comments:

01900230  sampled: 10/15/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit; Non-lethal

03900991  sampled: 11/14/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: Non-lethal
```

COMPANY: Whistle - Inco Ltd., Sudbury
(1603109)
SECTOR: Metal Mining
REGION: Northeast

SUMMARY

The data for one of two Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 35.4 %. The cause of this toxicity is probably high pH. The remaining sample had an LC50 >100% effluent. An audit sample tested by the MOE had an LC50 of 35.7 % effluent.

Minewater

```
03900450  sampled: 06/05/90     LC50:  >100  %
  95% fid. limits:     0.0 -    0.0 %
  comments: LC50 > 100

02900230  sampled: 10/15/90     LC50:      35.7 %
  95% fid. limits:    25.5 -   48.2 % slope:     3.6
  comments: MISA Audit\High Conductivity

03900991  sampled: 11/14/90     LC50:      35.4 %
  95% fid. limits:    27.8 -   45.0 % slope:     6.6
  comments:
```

COMPANY: Williams Mine - Teck Corona Inc., Hemlo (52710209)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for a trout bioassay submitted to MOE under the MISA monitoring regulation indicated the Minewater effluent was not acutely lethal to test fish. One audit sample tested by the MOE was non-lethal and another audit had an LC50 of >100% effluent.

The data for one of two trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was acutely lethal to test fish. Statistically, the percentage effluent required to kill 50 % of the test fish by the end of the four days exposure was 64.6 %. The cause of this toxicity is unknown but ammonia may contribute. The remaining sample was determined non-lethal. An audit sample tested by the MOE had an LC50 of >100% effluent.

Minewater

```
 01900179  sampled: 08/21/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit; Non-lethal

 04903626  sampled: 09/12/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 05900212  sampled: 10/10/90     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA audit sample
```

Final Discharge

```
 04900697  sampled: 03/29/90     LC50:      64.6 %
   95% fid. limits:   55.0 -  75.7 %
   comments:

 04901330  sampled: 06/06/90     non-lethal
   95% fid. limits:    0.0 -   0.0 %
   comments:

 01910158  sampled: 07/30/91     LC50:  >100  %
   95% fid. limits:    0.0 -   0.0 %
   comments: MISA Audit
```

COMPANY: Williams Mine - Teck Corona Inc., Hemlo (52710209)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY
The data for two Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Minewater was acutely lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 80.6 and 89.8 %. One audit sample tested by the MOE was non-lethal, and the other had an LC50 of >100%.

The data for one Daphnia bioassay submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was lethal to test animals. Statistically, the percentage effluent required to kill 50 % of the test animals by the end of the two days exposure was 65.7%. The cause of this toxicity is unknown but ammonia may contribute. An audit sample tested by the MOE had an LC50 of >100% effluent.

Minewater

```
04900697  sampled: 03/29/90     LC50:       89.8 %
  95% fid. limits:    0.0 -   0.0 %
  comments: confidence limits unreliable

02900179  sampled: 08/21/90     non-lethal
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit,Non-lethal,Very High Conductivity

04903626  sampled: 09/12/90     LC50:       80.6 %
  95% fid. limits:   73.0 -  88.9 %
  comments:

05900212  sampled: 10/10/90     LC50:   >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA audit sample.
```

Final Discharge

```
04901330  sampled: 06/06/90     LC50:       65.7 %
  95% fid. limits:   34.8 - 123.7 %
  comments:

02910158  sampled: 07/30/91     LC50:   >100   %
  95% fid. limits:    0.0 -   0.0 %
  comments: MISA Audit
```

COMPANY: Winston Lake Mine - Minnova Inc., District of Thund
(96100003)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for three trout bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test fish. An audit sample tested by the MOE was also determined non-lethal.

Final Discharge

```
 04902633  sampled: 07/24/90     non-lethal
   95% fid. limits:    0.0 -    0.0 %
   comments: non-lethal

 01900170  sampled: 08/08/90     non-lethal
   95% fid. limits:    0.0 -    0.0 %
   comments: MISA Audit; Non-lethal

 04904690  sampled: 10/24/90     non-lethal
   95% fid. limits:    0.0 -    0.0 %
   comments:

 04910081  sampled: 01/07/91     non-lethal
   95% fid. limits:    0.0 -    0.0 %
   comments: non-lethal
```

COMPANY: Winston Lake Mine - Minnova Inc., District of Thunder B
(96100003)
SECTOR: Metal Mining
REGION: Northwest

SUMMARY

The data for one of three Daphnia bioassays submitted to MOE under the MISA monitoring regulation indicated the Final Discharge effluent was not acutely lethal to test animals. The remaining two samples had LC50s >100% effluent. An audit sample tested by the MOE had an LC50 of >100%.

Final Discharge

```
04902633  sampled: 07/24/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments:

02900170  sampled: 08/09/90     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments: MISA Audit; Very high conductivity

04904690  sampled: 10/24/90     non-lethal
  95% fid. limits:     0.0 -   0.0 %
  comments: Non-Lethal

04910081  sampled: 01/07/91     LC50:  >100  %
  95% fid. limits:     0.0 -   0.0 %
  comments:
```